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HE Briefing:

Maintaining the UK's Science, Engineering and Technology sector: the case for high-cost subjects support

Summary

Retaining sector-specific support for high-cost subjects is vital to maintaining provision of science, engineering and technology (SET) education in the UK.

Current government funding for teaching is limited and thinly spread, covering spending aimed at widening participation, supplements for London-based institutions, subsidy for a small number of specialist institutions, and support for subjects that cost more than £9,000 p.a. to teach (high-costs subjects support).[1]

With the Government's student support budget likely to overspend substantially,[2] there will be pressure to claw back funding from within the HEFCE teaching budget.

This briefing highlights the importance of high-costs subject support in maintaining the UK's science, engineering and technology base.

Headlines:

- Science, engineering and technology (SET) subjects are strategically important, because of their significant economic impact, but often vulnerable because of the lower proportion of UK students studying them, and the high relative cost of providing courses in these subjects;
- Universities that specialise in SET provision and educate high proportions of SET students are especially reliant on the high-costs courses funding;
- Although many SET students study at larger multi-disciplinary institutions—institutions that might be able to cross-subsidise from less resource-intensive courses—the removal of funding would have a significant destabilizing effect on smaller specialist centres of excellence within small and medium universities;
- The removal of the high-cost subjects support would cost an institution such as Loughborough University over £5m, requiring substantial cuts to student numbers for the University's world-renowned science, engineering and technology courses.

Background

On 9th December, 2010, Parliament voted to raise the tuition fees cap, allowing universities to charge students up to £9,000 p.a. At the same time, the Department of Business, Innovation and Skills (BIS) announced that they would reduce the universities teaching grant accordingly.

In response to this reduction, the Higher Education Funding Council England (HEFCE) announced it would no longer provide funding to universities to cover the costs of teaching lower-cost subjects, such as humanities. In the first year of the new regime (2012–13), HEFCE cut £1.24bn from its student support budget.

Nonetheless, as many courses cost universities more than £9,000 p.a. to teach—usually clinical and lab-based

[1] HEFCE. 2012. *Funding for universities and colleges for 2012-13: Board decisions*. Online. Available at: http://www.hefce.ac.uk/pubs/year/2012/cl032012/

[2] Thompson, J. and B. Bekhradnia. 2012. *The cost of the Government's reforms of financing higher education*. Online. Available at: http://www.hepi.ac.uk/466/Reports.html

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programmes—HEFCE agreed to continue supporting these higher-cost subjects through targeted subsidies. During the 2012–13 cycle, HEIs received subsidies of £9,804 p.a. per full-time equivalent (FTE) student studying medicine or dentistry during their clinical years (3–5 years) and £1,483 p.a. per FTE student studying science, engineering, or technology (SET).[3]

Finally, to compensate for the increase in tuition fees, universities agreed to increase their spend on widening participation. All HEIs charging home full-time students between £6,000–9,000 p.a. for tuition are required to sign access agreements approved by Office for Fair Access (OFFA). These agreements detail the HEIs' financial commitments to widening participation. In particular HEIs agreed to ring fence proportions of their tuition fee income for the purposes of encouraging underrepresented students to attend university.

It is also worth noting that HEFCE has been providing non-mainstream funding for four very high cost subjects since 2007. This has provided additional funding for Chemistry, Physics, Chemical Engineering and Materials; HEFCE has recently announced that it will continue this funding and recalculate it using the latest data. This is highly welcome, but we would hope that this would be protected.

Higher education overspend

The Government's predictions for the average tuition fees that institutions would charge and its estimates for the long-term cost to Treasury of lending for student loans—the Resource Accounting and Budgeting (RAB) charge—proved optimistic. It is now agreed that actual costs will outstrip original estimates: higher tuition fees will increase the size of the student loans book, and lower salaries will put pressure on repayment rates.

In their original calculations, BIS assumed that HEIs would charge an average tuition fee of £7,579 p.a. and that the average male graduate would earn £99,500 p.a. after 30 years. OFFA calculates that the average tuition fee over the 2012–13 period was actually £8,385 p.a.[4] Last year, a report published by Higher Education Policy Institute (HEPI) questioned the Government's assumption that graduate earnings would grow at 1960s–70s' rates. In their most recent calculations, BIS adjusted the average earnings figure down to £76,500 p.a.[5]

As a result, the overall budget for student teaching support is now likely to incur an overspend: although the Universities Minister has indicated that the government's estimate of this amounts to approximately £200m p.a., HEPI has suggested the figure may be as high as £680m.[6]

This shortfall, if passed on to the wider budget for teaching support, may lead HEFCE to consider reducing or cutting some items of expenditure within the budget for higher education teaching. However, a superficially attractive solution such as reducing high-cost subject support would have serious implications for SET provision, and long-term consequences for the UK economy.

Contribution of SET to the economy

Science, technology and engineering make significant contributions to the UK economy. At its most direct, SET contributes to UK GDP through corporate spending on research and development (R&D) and through the revenues generated by university 'spin-outs' originating in novel SET research.

In 2011, corporate R&D expenditure in the UK science-base totalled £17.4bn, accounting for 1.1% of national GDP. And against a poor economic backdrop, R&D investment continues to show resilient growth. The 2011 investment figure represents 6% real terms growth on 2010, and 59.6% on 1985. The industry employs 158,000 workers in high-quality, well-paid jobs.[7]

BIS estimate that R&D accounted for 51% of all UK productivity growth between 2000–2009.[8] Or, put in more substantive terms, the IMF estimates that for every £1.00 invested in R&D, £0.24 will be added to the domestic economy year-on-year in perpetuity.

In 2011, formal university spin-out companies generated £1.16bn in revenues and employed over 7,300 people, and spin-outs remaining under university ownership generated a further £740.7m in revenues and employed a further 9,600 people.[9] Additionally, CaSE notes that 31 spin-out companies were floated on the stock exchange between 2003–5 with an estimated IPO value of £1.5bn, and in that same period 10 spin-out companies were bought privately for a total of £1.9bn.[10]

In a landmark study, London Economics estimated the SET-intensive sectors contributed £252.4bn to the UK economy in 2002, accounting for 27.3% of UK value added.[11]

[3] HEFCE. 2012. *Decisions on HEFCE funding for higher education 2012–13*. Online. Available at: http://www.hefce.ac.uk/news/newsarchive/2012/name,69544,en.html

[4] OFFA. 2012. *OFFA announces descisions on 2013–14 access agreements*. Online. Available at: http://www.offa.org.uk/press-releases/

[5] Thompson, J. and B. Bekhradnia. 2012. *The cost of the Government's reforms of financing higher education*. Online. Available at: http://www.hepi.ac.uk/466/Reports.html

[6] ibid.

[7] ONS. 2012. *Business enterprise research and development, 2011*. Online. Available at: http://www.ons.gov.uk/ons/dcp171778_287868.pdf

[8] BIS. 2012. *Annual innovation report 2012*. Online. Available at: https://www.gov.uk/government/publications/

[9] Higher Education Information Database for Institutions.

[10] CaSE. 2010. *Securing our ecnomic future with science and engineering*. Online. Available at: http://www.sciencecampaign.org.uk/documents/

[11] Engineering and Technology Board. 2004. *Wealth Creation from Science, Engineering and Technology in the UK*. London Economics.

Subject	Course cost (£)	Income (£)[12]	Total (£)
Biosciences	9190	9682	+461
Chemistry	9840	9682	−158
Chemical engineering	9690	9682	−8
Civil engineering	8910	9682	+772
Earth, marine & enviro. sci.	10140	9682	−458
General engineering	9930	9682	−248
Electronic & computer eng.	10010	9682	−328
Mech., aero. & prod. eng.	9940	9682	−258
Mineral, metallugy & mat. sci.	10820	9682	−1138
Physics	10620	9682	−938

Table 1: Costings per student for SET courses in 2015–16

Funding high-cost courses

However, educating SET students is expensive. On average, it costs universities £9,909 p.a. per student to run SET courses, with some costing significantly more—it costs £10,620 p.a. to fund a physics student's education and £10,820 p.a. to fund a material scientist's education. These costs are funded through a combination of student tuition fees income and high-cost subject support funds received from HEFCE.

After taking access agreement costs into account, our calculations (see *Table 1*) show that even with current subsidies most SET courses run at a loss. In access agreements for 2012–13, HEIs agreed to ring fence an average of 26.3% of any tuition fees charged over the £6,000 threshold for widening participation,[13] meaning that HEIs which charge tuition fees of £9,000 p.a. must set aside £789 per student in 2012–13 rising to £801 in 2015–16.

Once course and access agreement costs are set off against student fees and high-cost subjects support (£1,483) for each student, 7 out of 10 SET courses run at a loss; and by 2015–16, this will rise to 8 out of 10. By 2015–16, physics courses will run at a loss of £938 per student and material science courses at a loss of £1,138 per student.

As research is funded on a transparent, full costs basis, it is not possible to subsidise undergraduate teaching costs from research grants. This leaves institutions with the option of either reducing teaching spending on SET undergraduates or cross-subsidising from less expensive courses.

In practice, most universities cross-subsidise to cover SET funding shortfalls. In particular, as humanities courses run at a surplus—an average of £1,800 per student—these funds can be pooled and redistributed to science, engineering and technologies faculties to fund SET teaching and facilities.

Effectively, this means that if a university wants to accept 8 material science students, they also have to accept 5 humanities students to balance the books, and if they want to accept 2 physics students, they will also have to accept 1 humanities student. This ratio is 4:1 for environmental scientists, 5:1 for general engineers, and 7:1 for aeronautical engineers.

Impact on SET

There are, however, constraints on institutions' abilities to cross-subsidise high-cost courses from fees for arts and humanities courses. There is substantial competition among institutions which may over time lead arts and humanities departments to increase spending on their courses in response to student expectations.

Moreover, cross-subsidy may not be feasible for institutions which have developed specialisms in high-cost subjects. Such specialism brings benefits. Academic research is often at its most effective in specialist and ultra-specialist institutions. Specialism ensures that scarce resources are used effectively: world class researchers and public funds are pooled, so that HEIs have the professional and financial capital to conduct intensive research and buy expensive equipment.

However, institutions that have developed excellence in targeted research areas, are unlikely to have the resources, capacity, or flexibility to expand other departments in order to cross-subsidise SET provision through an increase in provision of lower cost humanities courses. Without support for high-cost courses, it is possible that affected institutions will cut SET stu-

[12] This is the income received after accounting for tuition fee income, high-cost subject support, and access agreement costs. In particular: £9000 + £1483 − £801 = £9682.

[13] OFFA. 2012. *Access agreements 2012–13: Final data including initial teach training*. Online. Available at: http://www.offa.org.uk/publications/

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dent numbers or their lower their teaching spend per head.

It is for similar reasons that HEFCE already provides 'exceptional funding' for 22 ultra-specialist institutions, including art schools, agricultural colleges, and single-faculty universities.

Moreover, if institutions with SET specialisms were to expand, or bolt-on, arts and humanities departments to cross subsidise high-cost courses, they would lose their distinctive specialist characters.

Finally, it is still too early to assess the impact that the Coalition's higher education reforms will have on pre-existing institutional practices. As such, it is vital that high-cost course support remains in place changes until hard data, collected by the Higher Education Statistics Agency (HESA), can give us a fuller picture of the financial climate and the impact of the higher education reforms.

Case Study: Loughborough University

Loughborough University is a world class research-intensive university with acclaimed excellence in science, engineering, and technology.

60.8% of its undergraduates study SET courses.[14] Its engineering departments are renowned worldwide for their research excellence: it has 6 engineering schools, all ranked within the UK's top-10 for their respective subject areas; it is the UK's biggest supplier of engineering placements by volume, and 9 out of 10 of its graduates go onto employment (or further study) within 6 months. In sum, it is the type of innovative, research-focused institution that drives UK economic growth.

The removal of the high-cost subject support would put this excellence in severe jeopardy.

Under its access agreement with OFFA, Loughborough spends at least 27% of revenue from fees over £6,000 on access measures.

We have calculated that a 10% cut in high-cost subject support would cost Loughborough's SET departments £502,000 per year; and a 50% cut £2.5m per year by 2015–16. Loss of high-cost subject support altogether would cost the departments over £5m per year. To put these figures in perspective, to make up for the loss, Loughborough would need to recruit an additional 2,632 students to its Social Sciences and Politics, History and International Relations departments—effectively tripling the combined size of these departments.

Without support for high-cost subject teaching, Loughborough would be forced to make substantial cuts to student numbers in science, engineering and technology. In short, loss of this support would be catastrophic to Loughborough University's SET excellence, and the wider UK economy.

Conclusion

As argued earlier, if the Government wants to see a return to sustainable economic growth, it is essential that they remain committed to the provision of high-quality SET education. It is for that reason that we welcomed the science ring fence announced in 2010, as well as the Government's well-publicised, ongoing commitments to biotechnology, mechanical and aeronautical manufacturing, information technology, big data, and energy industries,[15] all falling squarely within SET.

It is for this same reason that support for high-cost courses remains vital. Without such support, some of the UK's leading science, engineering and technology courses would not be viable; specialist institutions producing world-leading research and training the scientists and engineers of the future would be vulnerable; and the UK would be placing at risk the technological base on which future economic growth depends.

[13] Higher Education Information Database for Institutions.

[15] David Willetts. 2013. *Eight great technologies*. Online. Available at: http://www.policyexchange.org.uk/publications